

**Magneto-optical study of the colossal magneto-resistance pyrochlore
 $\text{Ti}_2\text{Mn}_2\text{O}_7$**

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Pyrochlore Mn compound $\text{Ti}_2\text{Mn}_2\text{O}_7$ has been found* to exhibit a colossal magneto-resistance (CMR) that is comparable to those for the perovskite manganites such as $\text{La}_{1-x}\text{Sr}_x\text{MnO}_3$. The CMR mechanism in $\text{Ti}_2\text{Mn}_2\text{O}_7$ is very interesting, in particular because it is believed to be quite different from that for the perovskites.* In order to probe the microscopic electronic structures of $\text{Ti}_2\text{Mn}_2\text{O}_7$, we have measured its optical conductivity [$\sigma(\omega)$] in wide ranges of photon energy, temperature (T), and external magnetic field (B) to 6 T. $\sigma(\omega)$ below ~ 0.2 eV has shown large increases on cooling through the Curie temperature $T_c=120$ K, and also on applying magnetic fields near and slightly above T_c . These spectral evolutions indicate that the electronic structures near the Fermi level become metallic in the ferromagnetic (FM) phase, either by lowering T or by applying external B . We have also observed a pronounced magnetic circular dichroism in the FM phase, near the plasma resonance at ~ 0.15 eV. We will analyze and discuss these results in terms of the electronic structures of $\text{Ti}_2\text{Mn}_2\text{O}_7$, emphasizing different characters from those for the perovskites.

*Y. Shimakawa *et al.*, Nature **379**, 53 (1996); M.A. Subramanian *et al.*, Science **273**, 81 (1996); S.-W. Cheong *et al.*, Solid State Commun. **98**, 163 (1996).